CLAIMS

1. A process for the preparation of estra-1,3,5(10)-trien-3,15α,16α,17β-tetraol (**1**) which comprises the steps of:
   1) converting estrone (**7**) into 3-A-oxy-estra-1,3,5(10),15-tetraen-17-one (**6**), wherein A is a protecting group;
   2) reduction of the 17-keto group of 3-A-oxy-estra-1,3,5(10),15-tetraen-17-one (**6**) to 3-A-oxy-estra-1,3,5(10),15-tetraen-17β-ol (**5**);
   3) protection of the 17-OH group of 3-A-oxy-estra-1,3,5(10),15-tetraen-17β-ol (**5**) to 3-A-oxy-17-C-oxy-estra-1,3,5(10),15-tetraene (**4**), wherein C is a protecting group;
   4) oxidizing the carbon-carbon double bond of ring D of 3-A-oxy-17-C-oxy-estra-1,3,5(10),15-tetraene (**4**) to protected estetrol (**3**); and
   5) removing the protecting groups, wherein preferably protecting group A is removed first to form 17-OC protected estetrol (**2**) and subsequently protecting group C is removed to form estetrol (**1**);

   wherein the protecting group A is selected from an C_1-C_5 alkyl group or a $C_7 - C_{12}$ benzylic group and the protecting group C is selected from monofunctional aliphatic hydroxyl protecting groups.
2. Process according to Claim 1, wherein the protecting group is a $C_7 - C_{12}$ benzylic group.
3. Process according to Claim 2, wherein the protecting group is a benzyl group.
4. Process according to any one of Claims 1 – 3, wherein the protecting group C is selected from monofunctional aliphatic hydroxyl protecting groups.
5. Process according to Claim 4, wherein the monofunctional aliphatic hydroxyl protecting group is acetyl.
6. Process according to any one of Claims 1 - 5, wherein the reduction of the carbonyl group is carried out using a reducing agent selected from the group of metal hydride compounds.
7. Process according to claim 6, wherein the metal hydride compound is selected from the group consisting of $LiAlH_4$, $NaBH_4$, $NaBH(OAc)_3$, $ZnBH_4$, and $NaBH_4/CeCl_3$.

8. Process according to claim 7, wherein the metal hydride compound is $NaBH_4$ in combination with $CeCl_3$ hydrate.

9. Process according to any one of Claims 1 - 8, wherein the oxidation of the carbon carbon double bond in ring D is carried out with an oxidizing agent comprising osmium tetroxide.

10. Process according to claim 9, wheren the oxidizing agent is osmium tetroxide immobilized on PVP (OsO_4-PVP).

11. Process according to any one of the precedings Claims 1 - 10, wherein the oxidation of the carbon-carbon double bond in ring D is carried out with a catalytic amount of OsO_4-PVP.

12. Process according to any one of Claims 9 - 11, wherein OsO_4-PVP is used in combination with a co-oxidant.

13. Process according to Claim 12, wherein the co-oxidant is selected from the group consisting of trimethylamine-N-oxide, N-methyl morpholine-N-oxide or hydrogen peroxide.

14. Process according to Claim 13, wherein the co-oxidant is trimethylamine-N-oxide.

15. Process according to any one of Claims 1 to 14, wherein the protective $C_7 - C_{12}$ benzylic group is removed by catalytic hydrogenation conditions.

16. Process according to Claim 15, wherein the catalytic hydrogenation conditions comprise a hydrogenation reaction using Pd on activated carbon under a hydrogen atmosphere.

17. Process according to any one of Claims 1 - 16, wherein the protective $C_1 - C_5$ alkyl group is removed by using BBr_3.

18. A process for the preparation of 3-A-oxy-estra-1,3,5(10),15-tetraen-17-one (**6**) comprising the following steps:

(a1) conversion of the 3-OH group of estron (**7**) into a 3-AO group to form 3-A-oxy-estra-1,3,5(10)-trien-17-one (**8**);

(b1) conversion of the 17-keto group of 3-A-oxy-estra-1,3,5(10)-trien-17-one (**8**) into a protected keto group to form 3-A-oxy-17-D-estra-1,3,5(10)-triene (**9**);

(c1) halogenation of C_{16} of 3-A-oxy-17-D-estra-1,3,5(10)-triene (**9**) to form 3-A-oxy-16-X-17-D-estra-1,3,5(10)-triene (**10**) wherein X is a halogen atom

selected from the group chloride, bromide and iodide and wherein X is preferably bromide;

(d1) dehalogenation of 3-A-oxy-16-X-17-D-estra-1,3,5(10)-triene (**10**) to 3-A-oxy-17-D-estra-1,3,5(10),15-tetraene (**11**); and

(e1) deprotection of the protected keto group of 3-A-oxy-17-D-estra-1,3,5(10),15-tetraene (**11**) to form 3-A-oxy-estra-1,3,5(10),15-tetraen-17-one (**6**);

wherein A is selected from an C_1-C_5 alkyl group, preferably a methyl group, or a C_7 – C_{12} benzylic group, preferably a benzyl group, and wherein D is ethylene dioxy.

19. A process the preparation of 3-A-oxy-estra-1,3,5(10),15-tetraen-17-one (**6**) comprising the following steps:

(a2) conversion of the 17-keto group of estron (**7**) into a protected keto group to form 17-D-estra-1,3,5(10)-trien-3-ol (**12**);

(b2) conversion of the 3-OH group of 17-D-estra-1,3,5(10)-trien-3-ol (**12**) into a 3-AO group to form 3-A-oxy-17-D-estra-1,3,5(10)-trien-17-one (**9**);

(c2) halogenation of C_{16} of 3-A-oxy-17-D-estra-1,3,5(10)-triene (**9**) to form 3-A-oxy-16-X-17-D-estra-1,3,5(10)-triene (**10**) wherein X is a halogen atom selected from the group chloride, bromide and iodide and wherein X is preferably bromide;

(d2) dehalogenation of 3-A-oxy-16-X-17-D-estra-1,3,5(10)-triene (**10**) to 3-A-oxy-17-D-estra-1,3,5(10),15-tetraene (**11**); and

(e2) deprotection of the protected keto group of 3-A-oxy-17-D-estra-1,3,5(10),15-tetraene (**11**) to form 3-A-oxy-estra-1,3,5(10),15-tetraen-17-one (**6**);

wherein A is selected from an C_1-C_5 alkyl group, preferably a methyl group, or a C_7 – C_{12} benzylic group, preferably a benzyl group, and wherein D is ethylene dioxy.

20. Process according to either one of Claim 18 or 19, wherein the protected keto group D is formed by converting the 17-keto group with ethylene glycol.

21. Process according to any one of Claims 18 to 20, wherein steps (e1) and (e2) are carried out in the presence of a component selected from p-toluenesulfonic acid, pyridinium p-toluenesulfonate, and pyridinium chloride, preferably p-

toluenesulfonic acid, more preferably p-toluenesulfonic acid monohydrate using aqueous acetone as solvent.

22. Use of the product obtainable by the process of any of Claims 1 - 17 for the manufacture of a pharmaceutical composition, preferably for use in a method selected from a method of hormone replacement therapy, a method of treating vaginal dryness, a method of contraception, a method of enhancing libido, a method of treating skin, a method of promoting wound healing, and a method of treating or preventing a disorder selected from the group consisting of autoimmune diseases, breast tumours and colorectal tumours.

23. A cosmetic method of treating skin, wherein the method comprises the topical administration of the product obtainable by the process of any of Claims 1 - 17.

24. A compound according to formula **5**, wherein A is selected from a C_1-C_5 alkyl group or a $C_7 - C_{12}$ benzylic group.

25. A compound according to formula **4**, wherein A is selected from a C_1-C_5 alkyl group or a $C_7 - C_{12}$ benzylic group and C is selected from monofunctional aliphatic hydroxyl protecting groups.

26. A compound according to formula **3**, wherein A is selected from a C_1-C_5 alkyl group or a $C_7 - C_{12}$ benzylic group and C is selected from monofunctional aliphatic hydroxyl protecting groups.

27. A compound according to formula **2**, wherein C is selected from monofunctional aliphatic hydroxyl protecting groups.

28. A compound according to formula **8**, wherein A is a $C_7 - C_{12}$ benzylic group.

29. A compound according to formula **9**, wherein A is selected from a C_1-C_5 alkyl group or a $C_7 - C_{12}$ benzylic group and D is ethylene dioxy.

30. A compound according to formula **10**, wherein A is selected from a C_1-C_5 alkyl group or a $C_7 - C_{12}$ benzylic group, D is ethylene dioxy and X is halogen.

31. A compound according to formula **11**, wherein A is selected from a C_1-C_5 alkyl group or a $C_7 - C_{12}$ benzylic group and D is ethylene dioxy.